

REMARKS

Claims 15-24 and 35-41 are pending in the application.

Claims 15-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over various cited combinations of Sharan, U.S. Patent No. 5,747,116; Smith, U.S. Patent No. 6,277,733; Brown, U.S. Patent No. 5,780,359 and Stinnett, U.S. Patent No. 6,325,861. The Examiner is reminded by direction to MPEP § 2143 that a proper obviousness rejection has the following three requirements: 1) there must be some suggestion or motivation to modify or combine reference teachings; 2) there must be a reasonable expectation of success; and 3) the combined references must teach or suggest all of the claim limitations. Claims 15-24 are allowable over the various cited combinations of Sharan, Smith, Brown and Stinnett for at least the reason that the references, individually or as combined, fail to disclose or suggest each and every limitation in any of those claims.

Independent claim 15 recites a plasma etching process comprising forming a mask layer, patterning the mask layer to form openings therein, extending the openings by etching material beneath the masking layer to outwardly expose a material comprising silicon at the base of the openings. Claim 15 further recites after the etching removing the masking layer and, after the removing and before subsequently depositing any material over the substrate, plasma etching the substrate. As discussed in the applicant's disclosure at, for example, page 2, lines 4-24; page 7, lines 6-11 and Fig. 3; page 8, lines 5-18; and page 9, lines 14-17, the recited process can overcome problems associated with unwanted residue that can form over the silicon base of an opening during etching of the opening. As explained, such residue can include carbon polymer derived from photoresist present during the etching to form the opening. The resulting residue, if not removed, can

occlude subsequently deposited materials from making suitable electric contact with the silicon base of the opening.

Sharan does not disclose or suggest the claim 15 recited etching a material beneath a masking layer through an opening thereby extending the opening to outwardly expose a material comprising silicon at the base of the opening. Further, Sharan does not disclose or suggest the recited forming a masking layer, the recited patterning a masking layer or the recited moving the masking layer after the etching to extend the opening. Smith discloses formation of an opening to expose a metal layer, removal of photoresist, and utilization of a plasma to remove hydrocarbon residue left on the metal surface (col. 3, ll. 63 through col. 4, ll. 43). Smith does not teach or suggest the claim 15 recited extending an opening to outwardly expose a material comprising silicon at the base of the opening and plasma etching the substrate prior to depositing any material over the substrate.

Stinnett discloses utilizing a patterned resist feature 20 during an etch process to extend a hole to expose an underlying metal layer 16 (col. 3, ll. 32-39). A cleaning step is then performed to remove etchant residue and resist prior to subsequent processing (col. 3, ll. 43-45). Stinnett does not disclose or suggest the claim 15 recited extending an opening by etching a material beneath a masking layer to outwardly expose a material comprising silicon at the base of the opening. As stated by the Examiner at page 4 of the present action Brown was cited to show that a "stripping process can be varied from 20° C to over 100° C". Brown does not disclose or suggest the claim 15 recited extending an opening by etching a material beneath a masking layer to outwardly expose a material comprising silicon at the base of the opening. Further, the Brown disclosure of varying a temperature from 20° C to over 100° C does not teach or suggest the claim 15 recited

plasma etching at a temperature of at least 400° C.

As combined, Sharan, Smith, Stinnett and Brown do not disclose or suggest the claim 15 recited etching a material beneath a masking layer to extend an opening to outwardly expose a material comprising silicon at the base of the opening, removing the masking layer from the substrate and after the removing the masking layer, plasma etching the substrate. Further, not one of the references addresses the problem of removing residue from a silicon surface at the base of an opening, the opening being etched in the presence of photoresist. Accordingly, independent claim 15 is not rendered obvious by the cited combination of Sharan, Stinnett, Smith and Brown and is allowable over these references.

Dependent claims 16-24 are allowable over the cited combinations of Sharan, Stinnett, Smith and Brown for at least the reason that they depend from allowable base claim 15.

Claims 35-41 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sharan and Stinnett or in the case of claims 36 and 37 over Sharan and Stinnett as further combined with Brown. Independent claim 35 recites dry etching a first layer immediately beneath a photoresist layer through an opening in the photoresist to extend the opening to expose a substrate material comprising silicon at the base surface of the opening, the etching forming a carbon containing polymer residue at least partially over the substrate material at the base of the opening. Independent claim 35 further recites plasma etching the carbon containing polymer residue after removing the photoresist layer from the substrate. As discussed above, not one of the cited references disclose or suggest the recited etching to extend an opening to expose a substrate material comprising silicon at

the base surface of the opening. As further discussed above, the recited method can advantageously remove residue from a silicon base surface that is formed during an etch performed in the presence of photoresist. Accordingly, independent claim 35 is allowable over the cited combinations of Sharan, Brown and Stinnett for at least reasons similar to those discussed above with respect to independent claim 15.

Dependent claims 36-41 are allowable over the cited combinations of Sharan, Stinnett and Brown for at least the reason that they depend from allowable base claim 35.

For the reasons discussed above, claims 15-24 and 35-41 are allowable. Accordingly, applicant respectfully requests formal allowance of pending claims 15-24 and 35-41 in the Examiner's next action.

Respectfully submitted,

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